

This time, you earn a certain number of points if the dart lands on the color you have chosen. This means that your choice of color involves more than just finding probabilities. You must also take into account the number of points that are awarded each time the dart lands on a certain color.

For each rug, decide which color is the best to bet on to maximize your points in the long run. Write clear explanations to support your answers.

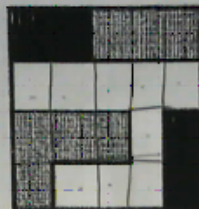
Gray  $\frac{8}{15} \times 6 = 3.2$

White  $\frac{7}{15} \times 8 = 3.7$

$(.53) \times 6 = 3.18$



A



B

$\frac{8}{15}$  Gray: 6 points

$\frac{7}{15}$  White: 8 points

Gray: 10 points  $\frac{7}{10} = 3.5$

White: 8 points  $\frac{9}{10} = 3.6$

Black: 16 points  $\frac{1}{10} = 3.2$



C



D

1.58  $\frac{4}{16}$  Gray: 5 points

2.25  $\frac{4}{16}$  White: 6 points

2.5  $\frac{4}{16}$  Black: 10 points

Gray: 15 points  $\frac{5}{16} = 7$

White: 13 points  $\frac{8.5}{16} = 6.9$

# One-and-One<sup>1</sup>

Sometimes in a basketball game, a player is presented with a situation known as a *one-and-one*.

In a *one-and-one* situation, the player begins by taking a free throw at the basket. If the player misses, that's the end. But if the shot is successful, the player gets to take a second shot.

One point is scored for each successful shot. So the player can end up with 0 points (by missing the first shot), 1 point (by making the first shot but missing the second), or 2 points (by making both shots).



Over many games, Terry has shown that whenever she attempts a free throw, she has about a 60% probability of making it.

In a *one-and-one* situation, how many points is Terry most likely to score: 0, 1, or 2?

Write down your intuitive guess to this question. Explain why you think that might be the answer.

60% OF MAKING IT WOULD BE 40% NOT MAKING IT

POINTS

0	(.40)
1	(.60)(.40) = .24
2	(.60)(.60) = .36

GREATEST PROBABILITY

Expected points off a free throw  
 $0(.40) + 1(.24) + 2(.36)$   
 $0 + .24 + .72$   
 $= .96$



60% x 60%  
NO!

CHANCE OF MAKING FIRST BASKET X CHANCE OF MAKING SECOND BASKET  
 AND



## Streak Shooting Shelly

When Streak-Shooting Shelly steps up for a one-and-one situation, her chances of making the first shot are 80%. If she makes her first free throw, there is a 90% chance she will make her second free throw.

1. In what percentage of one-and-one situations will Shelly score no points? One point? Two points?
2. What is Shelly's expected value per one-and-one situation?

$$\begin{array}{r}
 0 \quad | \quad .20 \\
 \hline
 1 \quad | \quad (.80)(.10) \\
 \hline
 2 \quad | \quad (.80)(.90)
 \end{array}
 = .20$$

$$\begin{array}{r}
 1 \quad | \quad (.80)(.10) \\
 \hline
 2 \quad | \quad (.80)(.90)
 \end{array}
 = .08$$

$$\begin{array}{r}
 2 \quad | \quad (.80)(.90) \\
 \hline
 \phantom{2} \quad | \quad \phantom{.80} \phantom{.90}
 \end{array}
 = .72$$

PROB  
OF  
1st

PROB  
OF  
2nd

$$\begin{array}{r}
 0(.20) + 1(.08) + 2(.72) \\
 0 + .08 + 1.44 = 1.52
 \end{array}$$

expected  
points

SHOW

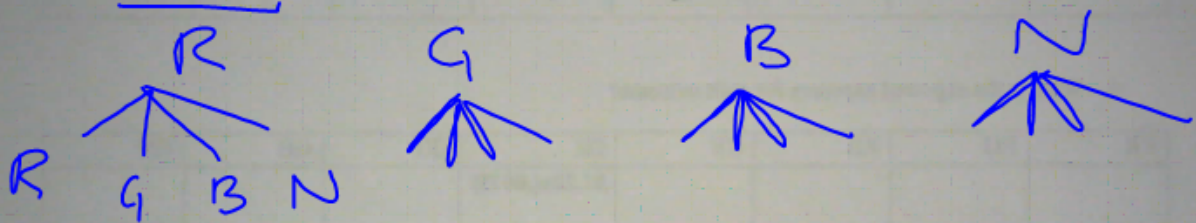
### Tree Diagram Games

Rebecca and Jake are trying to determine the theoretical probability of their game. In their game players try and toss two balls into cups. There are 20 cups. There is 1 red cup that wins a goldfish, 3 green cups where you can win a soda and 6 blue cups where you win a piece of candy. All other cups do not win anything.

1. What is the probability of each of the following? Write as a percent

Red cup	Green cup	Blue cup	No color cup
$\frac{1}{20}$ 5%	$\frac{3}{20}$ 15%	$\frac{6}{20}$ 30%	$\frac{10}{20}$ 50%

2. Since you get 2 chances to toss the ball draw a tree diagram that represents all total outcomes (there are 16 total outcomes). Include the percents in your tree diagram below.



3. What is the probability of each of the 16 outcomes?

RR	RG	RB (.05)(.30)= .015	RN	GR	GG	GB	GN
BR	BG	BB	BN	NR	NG	NB	NN

4. What are the PRIZES that each outcome would give away? Remember that some outcomes will win 2 prizes

